AT89STK-11 Starter Kit

Hardware User Guide

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Section 1

Introduction

This document describes the AT89STK-11 board dedicated to the standard C51 microcontrollers with in-system programming.

All of the microcontroller I/Os are made available in an expansion area with prototyping facilities.

1.1 Features

- Stand-alone Board
- In-System Programmable (ISP) including ‘Auto ISP’ feature
- On-board Voltage Regulator
- Microcontroler on its sockets
  - PLCC44-pin package
- On-board 3V or 5V power supply circuitry
  - from an external power connector
  - from an external battery
- On-board RESET
- Leds : Power, ALE, RS232 Rx and Tx
- External MCU clock connector
- External PCA clock connector
- TWI, SPI and RS232 connectors
- INT0 & INT1 Push-button
- Expansion area with prototyping facilities
- Commercial Temperature Range: 0 to +70°C Operating Temperature
- Dimension: 95 mm x 120 mm

1.2 Supported Devices

- AT89C51RE2/IE2
- AT89C51RB2/IE2
- AT89C51RC2/IC2
- AT89C51RD2/ID2/ED2
- AT89C51RD3/ID3

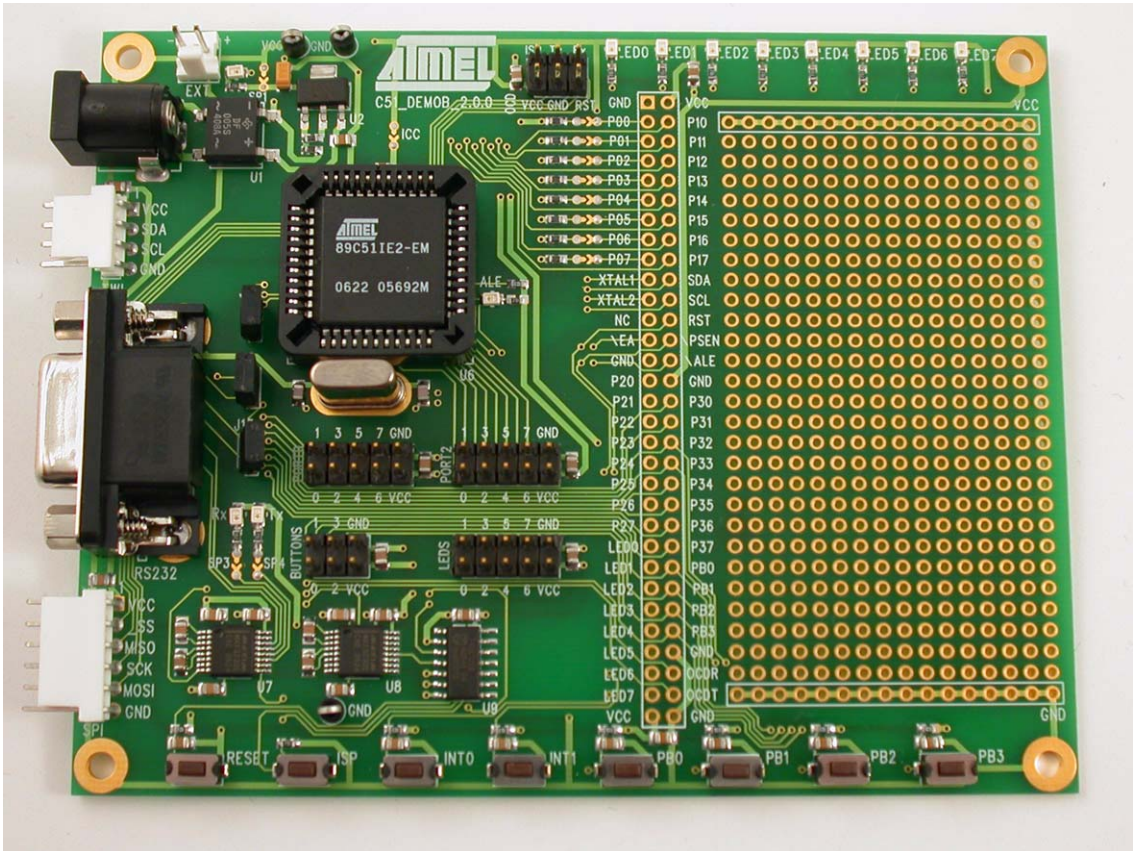
Section 2

Hardware Description

2.1 Board Overview

Figure 2-1 shows the AT89STK-11 board.

Figure 2-1. AT89STK-11



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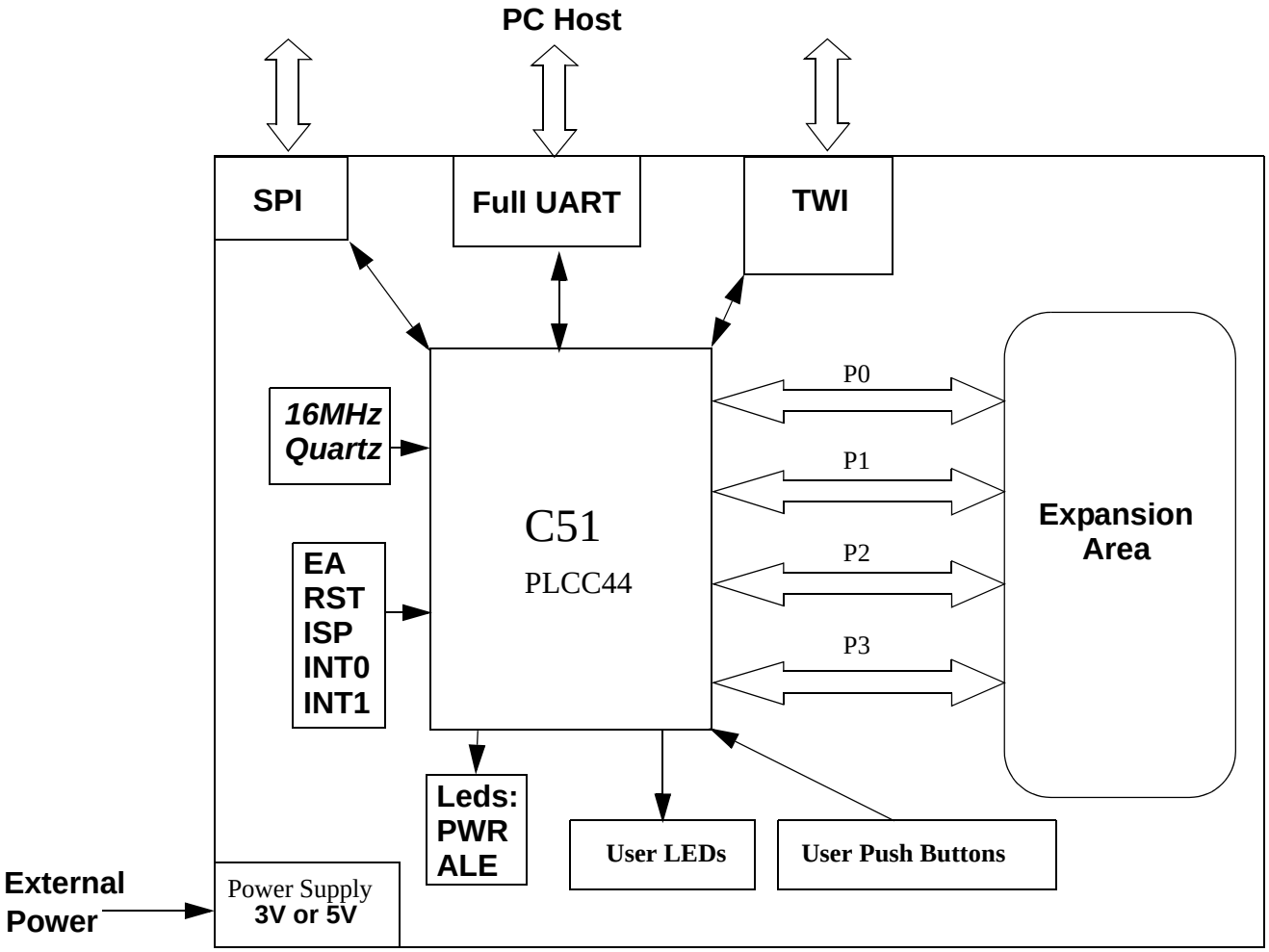
2.2 Block Diagram

Figure 2-2 shows the functional block diagram of the AT89STK-11, with the I/O usage.

Figure 2-2. Block Diagram of AT89STK-11



2.3 Power Supply

The on-board power supply circuitry allows various power supply configurations. This gives the user the capability to power the devices in the 3V and in the 5V voltage range.

2.3.1 Power Supply Sources

The power supply source can come from two different and **exclusive** sources:

- either from the JACK PWR connector
- either from the 2-point sip EXT connector.

2.3.1.1 JACK PWR Connector

The Jack power connector implemented on board is a female Jack connector with internal 2.1mm conductor. It requires a male JACK outlet with 2.1mm capability.

No specific polarization is mandatory as on-board diode rectifier gives a protection against inadvertent polarization invertion.

When using the JACK power supply, the board is powered with a 5V voltage.

Figure 2-2 . Male JACK Outlet and Wires

Caution: Do not mount more than **one** power supply source on AT89STK-11 Board.

Note: There is a diode voltage level between the negative output of the power supply and the “GND”. This could introduce some voltage gap during measurement and instrumentation.

2.3.1.2 External EXT connector

The battery power connector implemented on board is a male two point SIP connector. It requires an external power cable with a female 2 points connector.
When powered though this interface, polarization is mandatory as no protection is given on board.
The EXT power supply circuitry support input supply from 2.7V up to 5.5V DC.

Figure 2-3 . EXT PWR Female Connector / Cable

Caution: Do not mount more than **one** power supply source on board.

It is recommended to open the SP1 solder pad when using the EXT input to avoid regulator powering by the output.

2.4 Reset

To be compatible with Atmel microcontrollers which have (or not) its on-chip RESET circuitry (c.f.microcontroller datasheet), the board provides a RESET signal witch can come from 2 different sources:

2.4.1 Power-on RESET

The on-board RC network acts as power-on RESET.

2.4.2 RESET Push Button

By pressing the RESET push button on the board, a warm RESET of the microcontroller is performed.

2.5 Features

This section presents the various features such as leds, buttons, etc... available on the board.

2.5.1 Push-Buttons

- RESET can be used to apply warm reset to the MCU
- ISP can be used with RESET to apply hardware conditions resulting in bootloader start
- INT0 push-button can be used to activate INT0 input
- INT1 push-button can be used to activate INT1 input

2.5.2 User Push buttons

- PB0, PB1, PB2 and PB3 are four push-buttons available for user application

They are made available on a 6 pins socket and in the expansion area so user can use them according to the application needs.

2.5.3 Indicator LEDs

- PWR led is driven by input of voltage regulator
- Rx led is connected to Rx of UART MCU (SP3 jumper can be soldered or not)
- Tx led is connected to Tx of UART MCU (SP4 jumper can be soldered or not)
- ALE led is connected to ALE of MCU

2.5.4 User LEDs

- LED0, LED1, ... LED7 are height leds available for user application

They are made available on a 10 pins socket and in the expansion area so user can use them according to its application needs.

2.5.5 Ports

Port 0 and Port 2 are made available on two 10 pins sockets to ease user interconnection to the MCU.

The are also available on the expansion area.

2.5.6 Clocks

An external clock can be connected to the board to control externally XTAL1 input clock of MCU by using the XTAL1 from the expansion area.

In the same way, another external clock can be connected to control externally the PCA clock (P1.2/ECI).

2.6 Interfaces

2.6.1 TWI

The TWI connector is controlled by hardware TWI I/O of MCU (for Product including this feature). The signals sda and scl are controlled by the TWI ports of MCU.

This TWI bus is also connected to the expansion area.

External TWI pull-ups are not provided on the AT89STK-11.

2.6.2 SPI

The SPI connector is directly connected to SPI I/O of the MCU.

2.6.3 RS-232

The DB9 connector is connected to on-chip UART peripheral through a standard RS232 driver/receiver. Two leds are provided to indicate activity on Rx and Tx lines (They can be disconnected removing solder pad SP3 and SP4).

2.6.4 OCD

The On-Chip Debug interface (OCD) is provided on a 6-pin connector.

This interface enables the debug of the application through ATMEL OCD dongle for AT89C51RE2/IE2/RD3/IE3 only.

2.6.5 Expansion Area

In addition to a 16x29 pad array, two rows of pads are given on the right side of the board to offer all the MCU signals tu user application. Any application expansion can be built on board through this interface.

2.7 Board Settings

The C51 Demo Board has the following settings:

- Jumpers
- Solder straps
- Test points

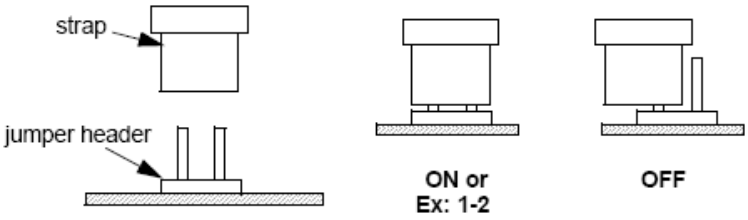
2.7.1 Jumpers

The following table provides an overview of the jumpers, the solder straps and their default configuration.

Table 2-1. Jumpers and Switches Overview

Reference	PCB Label	Function	Default
Jumper J11	J11	RTS of RS232	OFF
Jumper J12	J12	DTR of RS232	OFF
Jumper J13	J13		OFF

Figure 2-3. Jumper Setting Definition



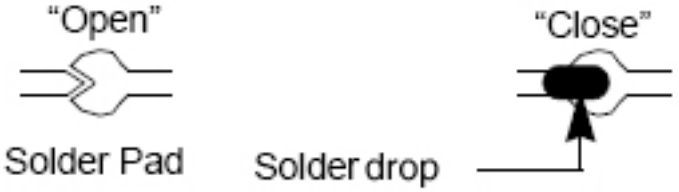
2.7.2 Solder Straps

Solder straps allow to modify the board configuration for specific usage.

Table 2-2. Solder Straps Overview

Reference	PCB Label	Function	Default
Solder strap SP1	SP1	External Power Supply Isolation	Soldered
Solder strap SP2	ICC	Consumption measurement	Soldered
Solder strap SP3	SP3	Rx Led	Soldered
Solder strap SP4	SP4	Tx Led	Soldered

Figure 2-4. Solder Strap Definition



2.7.3 Test Points

Test points are used to check the internal power supply of the microcontroller.

Table 2-3. Table of Test Points

Reference	PCB Label	Function
TP1	VCC	Test point for Vcc
TP2,TP3	GND	Test point for GND

Section 3

ISP Programming

The On-Chip memories and configuration bytes can be programmed using the ISP mode of the device and Atmel's FLexible In-system Programmer Software (FLIP) described below.

3.1 Manual ISP Mode

See Section “FLIP Software”, page 12.

3.1.1 Board Configuration

To use ISP mode, the board should be configured as follow:

- POWER switch (SW1) on “ON” position
- EA jumper should be open (internal code execution only).

3.1.2 Operating Mode

To enter in ISP mode, press both the RESET and ISP buttons simultaneously. First release the RESET button and then the ISP button. The device enters in ISP mode.

3.2 Auto ISP Mode

It allows the host PC application (Atmel Flip software for example) to control the hardware conditions from the serial lines RTS and DTR.
Thus with the Auto ISP mode, the user does not need to push the ISP and RESET buttons.

3.2.1 Board Configuration

To use Auto ISP mode, put the board in the same configuration as ISP mode and also:

- Close RTS (J11) jumper
- Close DTR (J12) jumper

3.3 FLIP Software

FLIP software runs on Windows® and Linux® Operating Systems. FLIP supports in-system programming of Flash C51 devices through RS232. The latest version of FLIP software can be downloaded from the Atmel web site, www.atmel.com.

3.4 Batchisp Software

Batchisp is an In-System Programming application which can perform the same operations as FLIP but is designed to be launched from the DOS command window.

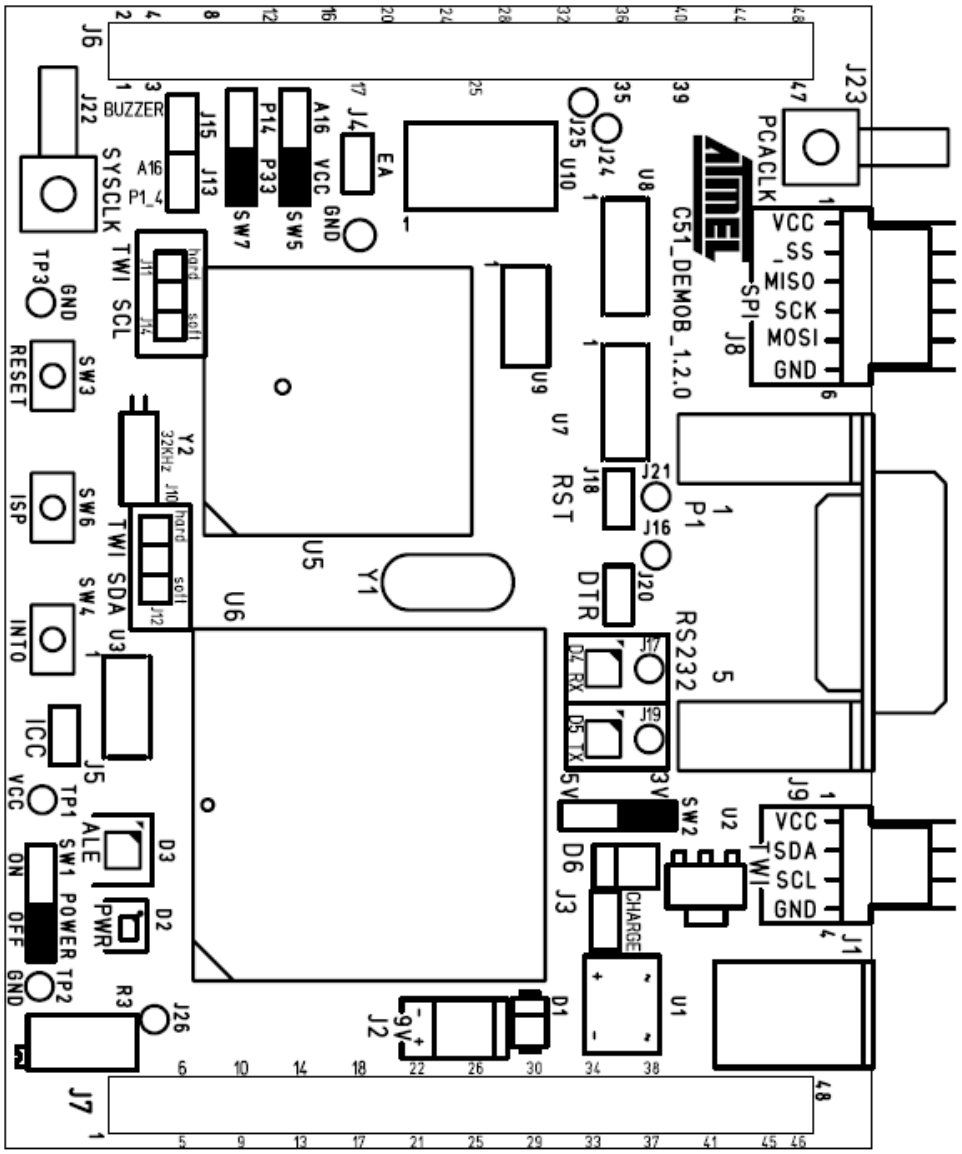
The main purpose of batchisp is to automate ISP operations on several parts. It may also be launched from an IDE like Keil's uVision2 one : you can compile and link your embedded program, generate the HEX file and download it to the target hardware without leaving the Keil's IDE. This makes embedded software development and test faster.

Autoisp function is an operation which allows to enter in ISP mode without any hardware handling.This is done thanks to DTR and RTS RS232 signals which can control on the Board the RST and PSEN I/O of MCU.

Section 4

Appendix A: Board Layout

Figure 4-1. Board Components View Diagram



Appendix B: Bill of Materials

4.1 Bill of Materials Table

Item	Q.ty	Reference	Part	Tech. Caracteristics	Package	Manufacturer
1	29	CD1,CD2,C2,CD3,C3,C4, CD5,C5,CD6,C6,CD7,C7,C8, C9,C10,C11,C12,C13,C16, C17,C18,C19,C20,C21,C22, C23,C24,C25,C26	100n	50V-10% Ceramic	CASE 0805	PHYCOMP
2	1	C1	1µF	10Vmin ±10%	Case A	AVX
3	2	C14,C15	22pF	10Vmin ±10%	EIA/IECQ 3216	PHYCOMP
4	1	D1	Red Led	I=10 mA		Agilent
5	11	D2,D3,D4,D5,D6,D7,D8,D9, D10,D11,D12	Green Led	I=10 mA		Agilent
6	1	J1	SIP2 SOCKET	.	Pitch 2.54mm	Molex
7	1	J2	CONNECTOR JACK PWR	Int.Diam=2.1mm	Int. Diam. 2.1mm	Cliff
8	1	J3	HEADER 31x2/SM			
9	2	J4,J8	HEADER 3X2	BARRETTE SECABLE	Pitch 2.54mm	Tyco Elec. / AMP
10	3	J5,J6,J10	HEADER 5X2	BARRETTE SECABLE	Pitch 2.54mm	Tyco Elec. / AMP
11	1	J7	CONNECTOR SIP6 RA	.	.	.
12	1	J9	SIP4	.	.	.
13	3	J11,J12,J13	JUMPER		Pitch 2.54mm	Tyco Elec. / AMP
13bis	3		JUMPER shunt		Pitch 2.54mm	Arwin
14	1	P1	SUB-D9 FEMALE	90° with harpoons		Tyco Elec. / AMP
15	1	R1	270	1/16W-5% SMD	Case 0603	Multicomp
16	14	R2,R5,R14,R15,R16,R17, R18,R19,R20,R21,R22,R23, R24	1K	0.06W, 5%	Case 0603	Multicomp
17	1	R3	820	1/16W-5% SMD	Case 0603	Multicomp
18	8	R4,R6,R8,R9,R10,R11,R12, R13	10k	0.06W, 5%	Case 0603	Multicomp
19	4	SP1,SP2,SP3,SP4,SP5, SP6, SP7, SP8, SP9, SP10, SP11, SP12	SolderPad			
20	8	SW1,SW2,SW3,SW4,SW5,SW6, SW7,SW8	PUSH-BUTTON	SMD, rectangular	See DS	ITT Canon
21	3	TP1,TP2,TP3	TEST POINT	Through Hole Pad	Hole 1.1mm	Vero
22	1	U1	DF005S		TO269AA	Vishay
23	1	U2	LM317		SOT-223	National
25	1	U6	AT8xC51_PLCC44	Socket		
25bis	1	U6	AT8xC51_PLCC44			
26	2	U7,U8	SIPEX-SP3232ECA	Ref=SP3232ECA	SSOP16	maxim
27	1	U9	74HC125/SO		SOIC	texas

Item	Q.ty	Reference	Part	Tech. Caracteristics	Package	Manufacturer
28	1	Y1	CRYSTAL	HC49	.	.
28bis	2	Y1	CRYSTAL tulip		.	.
29	8	R100, R101, R102, R103, R104, R105, R106, R107	4,7K	0.06W, 5%	Case 0603	Multicomp

Appendix C: Board Schematics

Figure 4-2. AT89STK-11 Schematics (1 of 4)

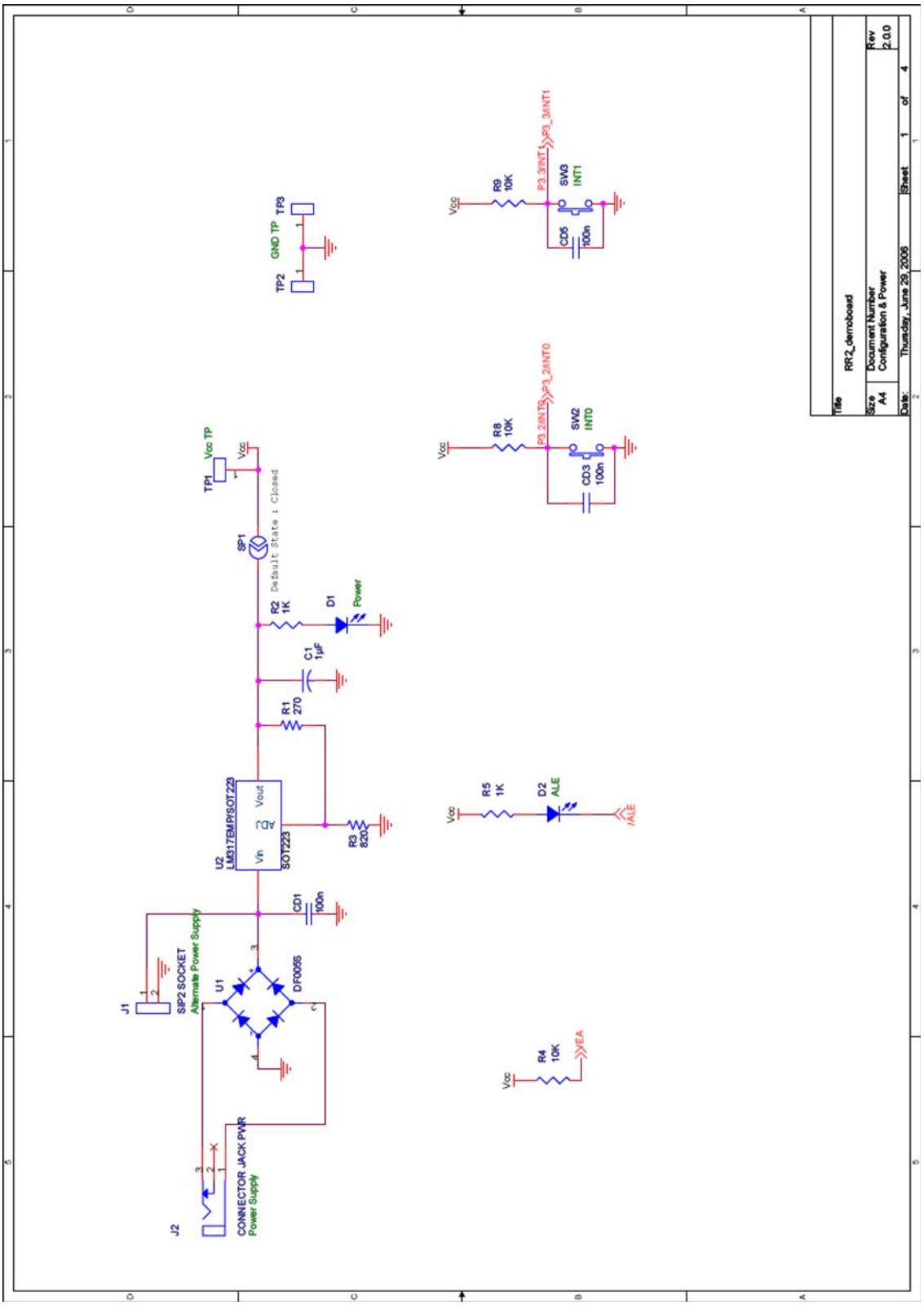


Figure 4-3. AT89STK-11 Schematics (2 of 4)

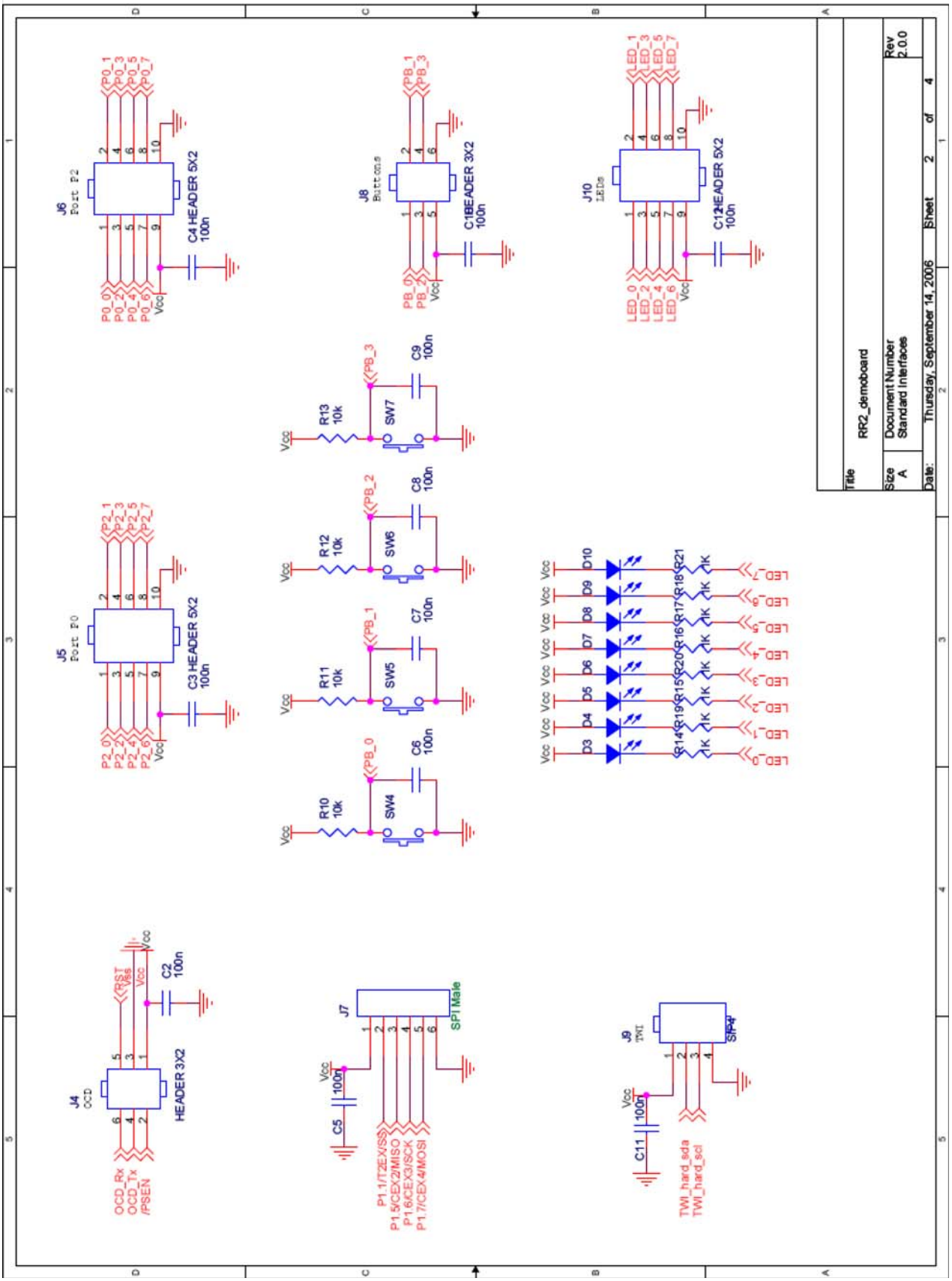


Figure 4-4. AT89STK-11 Schematics (3 of 4)

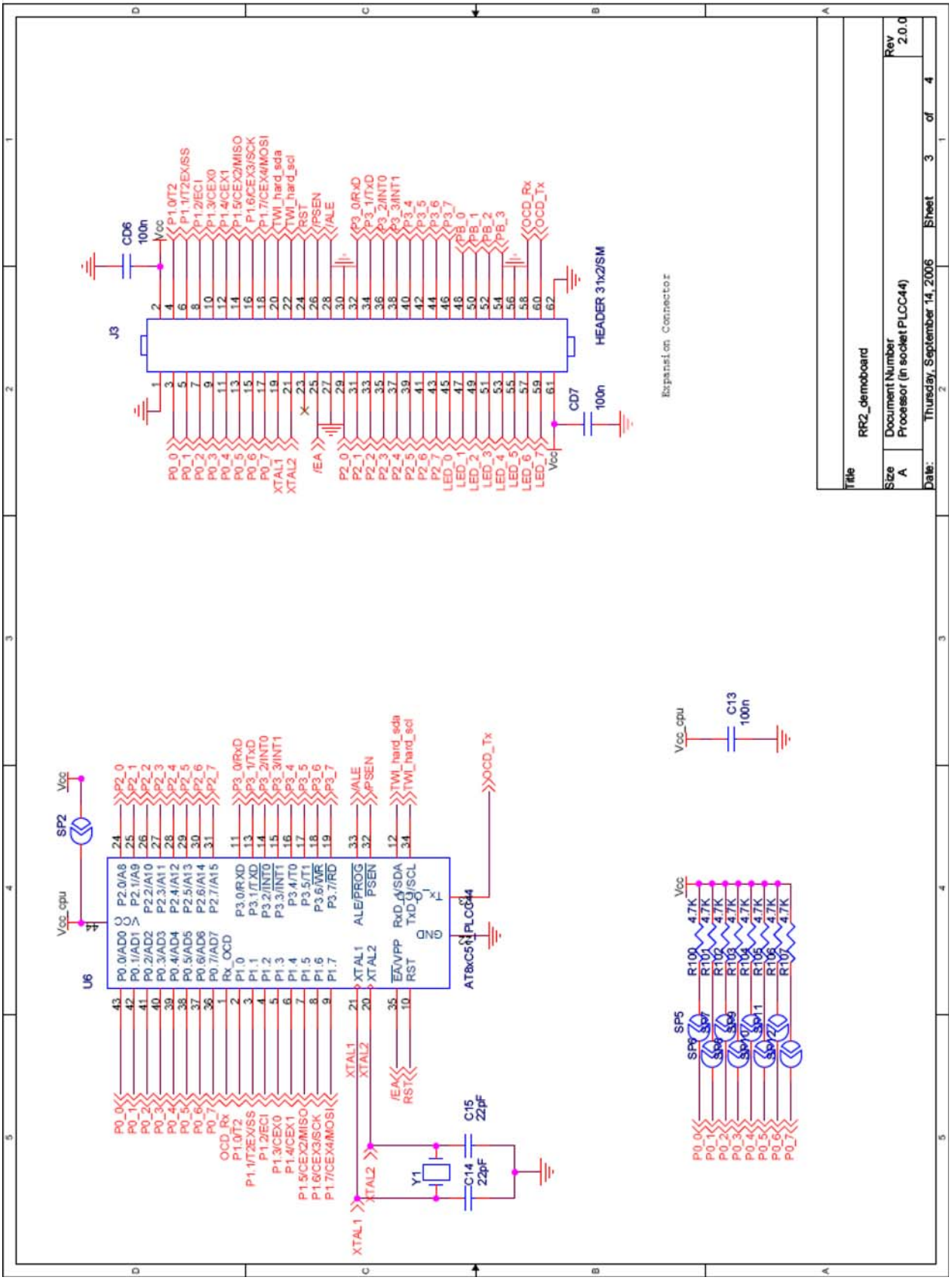
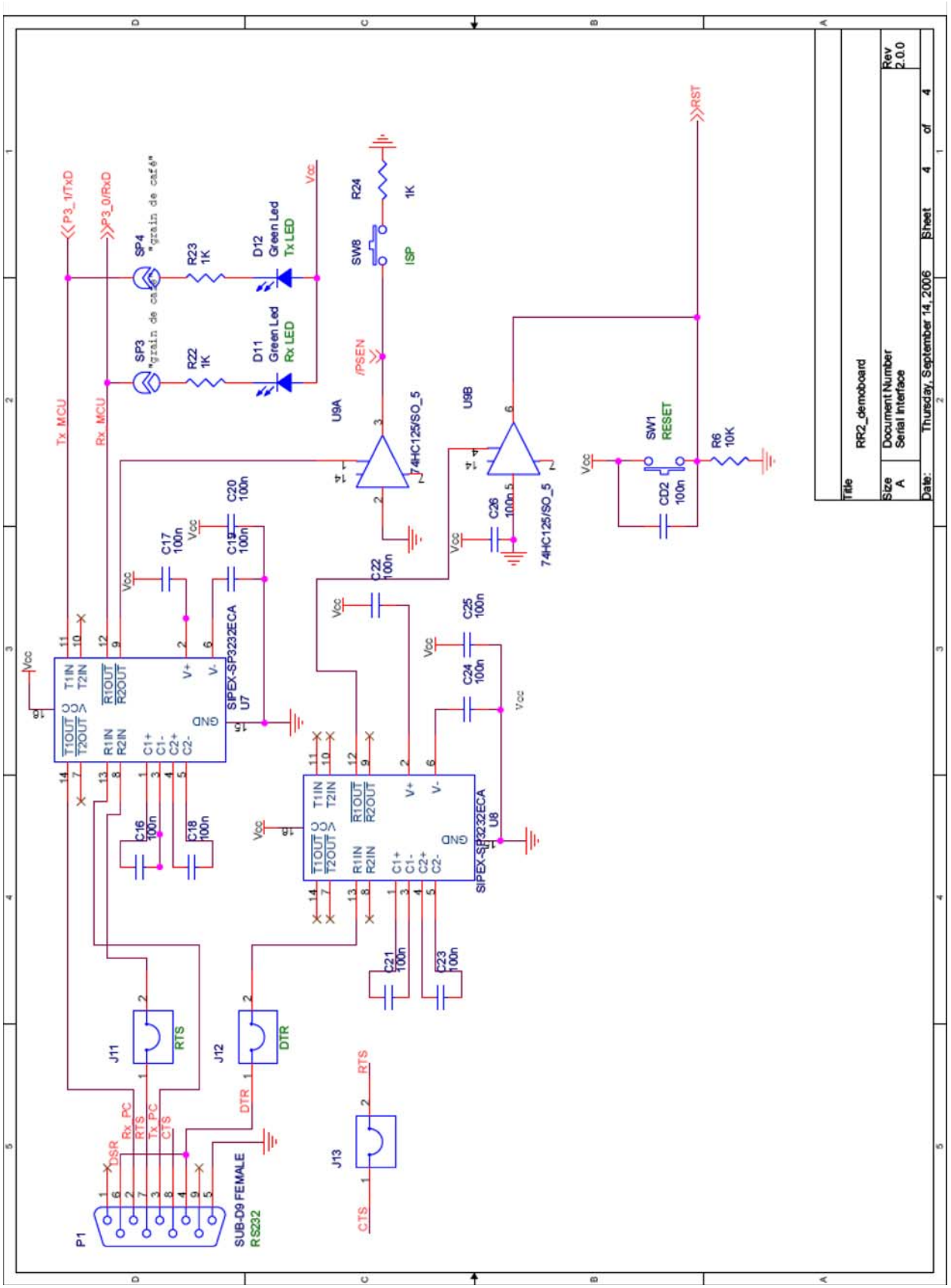


Figure 4-5. AT89STK-11 Schematics (4 of 4)



Appendix D: References/Acronyms

4.2 References

- AT89C51RD2/ID2/ED2/RB2/RC2/IC2/RE2/IE2 and AT89C51RD3/IE3 Product Datasheet.

4.3 Acronyms

- FLIP: FLexible In-system Programming
- ISP: In-System programming
- LPC: Low Pin Count microcontroller
- HPC: High Pin Count microcontroller (by opposition to LPC)

Atmel Corporation

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 487-2600

Regional Headquarters

Europe

Atmel Sarl
Route des Arsenaux 41
Case Postale 80
CH-1705 Fribourg
Switzerland
Tel: (41) 26-426-5555
Fax: (41) 26-426-5500

Asia

Room 1219
Chinachem Golden Plaza
77 Mody Road Tsimshatsui
East Kowloon
Hong Kong
Tel: (852) 2721-9778
Fax: (852) 2722-1369

Japan

9F, Tonetsu Shinkawa Bldg.
1-24-8 Shinkawa
Chuo-ku, Tokyo 104-0033
Japan
Tel: (81) 3-3523-3551
Fax: (81) 3-3523-7581

Atmel Operations

Memory

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

Microcontrollers

2325 Orchard Parkway
San Jose, CA 95131, USA
Tel: 1(408) 441-0311
Fax: 1(408) 436-4314

La Chantrerie
BP 70602
44306 Nantes Cedex 3, France
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Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

Scottish Enterprise Technology Park
Maxwell Building
East Kilbride G75 0QR, Scotland
Tel: (44) 1355-803-000
Fax: (44) 1355-242-743

RF/Automotive

Theresienstrasse 2
Postfach 3535
74025 Heilbronn, Germany
Tel: (49) 71-31-67-0
Fax: (49) 71-31-67-2340

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Colorado Springs, CO 80906, USA
Tel: 1(719) 576-3300
Fax: 1(719) 540-1759

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Avenue de Rochepleine
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38521 Saint-Egreve Cedex, France
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